SYSTEM TESTING FOR SOFTWARE FAULT TOLERANCE IN GRID COMPUTING

Jyoti
Student (M.Tech)
Department of CSE
Lovely Professional University
Jalandhar, Punjab, India

ABSTRACT

We have to briefly investigate the faulty objects in grid computing environment. The grid computing structure which we have used how old of that system and how the faults comes and we have proposed a testing technique to find the faulty object from the computing structure. Testing technique is related to cluster approach. Different types of clusters are defined in each level of clusters and test the overall grid structure. Grid computing is an important property for large scale system, which are geographically distributed to execute the tasks, and achieve the high level of reliability. We have to compute the graphical structure of default objects, in which time the fault created more than one time and how many faults are identified. The graphical notation is easily understanding approach used in grid computing. This approach combines the dynamic scheduling and traditional distributed system. The traditional models applied to improvements in grid computing, whether after improvement, these models have work in an reliable manner. We have to check the failure points in the matrix from also. The recovery is allowing in an efficient application by applying the testing capability in much efficient manner.

Keywords: Legacy system, Grid computing, Check pointing.

INTRODUCTION

In software project Grid is a structural design and program component of data that are required to build a Grid in computer based system. These components of system have interrelationship that occur among all architectural components of system. The architectural design have been implemented and analyzed its components that is best suitable to customer satisfaction and also related to its effective manner of cost and quality. The programmer of this architectural design has pre-compiled the program before its implementation in its IT technology. Development of highly available systems, fault tolerance can be implemented in software. In this paper, I have described a new approach for fault tolerance by using software testing. Fault managed in grid computing is big challenge for the application developers. The system is actually running in their behavior due to some circumstances the fault arises:

1) Process Failure
2) Network Failure
3) Hardware/Software Failure
4) Machine Crashes
5) Resource Crashes
6) Application Failure

Different types of failure may cause a single error or bug in any computing environment. The probability of failure rising with number of components. The different numbers of components are interconnected to distributed framework of software. Distributed system provides Redundancy and Replication mechanism for detecting the errors and reconfigures the system. In Grid approach, high definition of abstraction and implementation details are more needed than in a distributed system. Grid approach takes more time for execution than in distributed system. Grid approach is more suitable for commercial infrastructure in which a middleware approach is also helpful for connecting different connectors to main connect to its infrastructure.

Fault tolerance in Legacy System:
Legacy system provides us a software development environment. Legacy system related to Grid Computing in which appropriate model and services are configured. In these traditional system fault may occur and improvements are necessary. Grid computing of legacy system oriented the independent component in the software system. Some faulty objects are changed from one physical system to other physical system that are pulled out and again plugged in the software system. Each legacy system has separate objects that are coordinated with each other. If we pull out a single object or data from a software system which is not affect the processing of all the objects of software system. The component which is pulled out are repaired again and plugged in other physical system. Legacy system provides additional tools that are required for improvements like pulled out and plugged in different objects of a software system. Different improvement are related to a single object and may affect the overall processing of system but in legacy system the fault model arise within minimum amount of time, because it may used from long time. Traditional distributed system may incompatible and challenge for Grid computing to develop compiling techniques and adding the process of fault tolerance computation. Cost metrics is also effect to evaluate the fault tolerance mechanism. Large amount of cost affects the Grid computing infrastructure to adaptive in a correct manner. Because as the software’s, faulty objects are indentified and modified so we have to crash them. Grid environment of legacy system are complex. I have proposed the partial fault model for legacy Grid computing.

1) Requirement Error
   Improved requirement.
   Detailed requirement information.
   Amount of rework necessary.
2) Design Error
   Detailed design information.
   High level information.
   Recovered design information.
3) Implementation Error
   Usability of tools, training.
   Stability of vendor.
4) Documentation Error
   Data structure diagram
   Program structure
   Traceability
5) Physical Error

Network failure
Time fault
Omission fault
6) Conceptual Error
7) Time Fault Error
   Early detected fault
   Undetected faults related to Performance.

FIGURE1- Partial Fault Model for Legacy Grid Computing.

This model defines the faults that occur in legacy distributed system. Like some Grid services and legacy system are expire within maximum error occur in these systems. Different type of applications are run in the software system in grid environment so different type of errors are introduced in these services that supporting the different protocols. Improved Fault Model:

Figure2 Fault Model using different interfaces

This is Grid architecture of a software model in which different entities of people and devices interact through different interfaces and producing information that is necessary for requisite processing. An improved fault model identifies that where the faults may occur and in which time interval. It represents the flow of information into and out of the system. Target system is the higher level of processing system. User interface of client produce an input for the Grid environment and super ordinate system that supports the target system provide data for processing through database and also used the internet facility for complete the target system. Controller design of system controls the number
of issues or processing queries related to Grid architecture. Sensors of architecture sense the input of data that is in correct manner information for producing the output for target system. Peer level systems that are interact on peer-to-peer basis to the target system. Due to overall processing of Grid computing environment, the fault may occur due to:

1) Internet facility is not available.
2) Network crashes at the time of processing of data.
3) Sensors are not accurately sense the data.
4) Controllers of design system need to be improved due to larger computation.
5) Super ordinates systems do not help the target system to achieve its final output.
6) The Grid architecture needs to be updated according to new technologies and tools.

Due to these reasons n-number of errors or faults may occur in this Grid computing environment.

Fault Tolerance Solution:

I have proposed a new fault tolerance solution based upon the testing technique. We should apply the testing to entire system or a small part of it. It is conducted haphazardly time is wasted, errors sneak through undetected. So, we specify the testing by defining a plan that describe the all specific functions and tests that are conducted in any Grid architecture.

Figure 3: Testing Approaches used in Grid Structure

Testing is an important application for any Grid structure. After constructing a Grid structure environment, we have to apply a testing strategy to the overall system so that less number of faults occurs in its processing time. The faults are covered during the testing if the Grid structure of a software system and our system will be processed in a reliable manner. We have to make clusters of different interfaces of Grid structure and apply different approaches of testing to the Grid system and identify the faulty objects that are undetected during the structural implementation of a Grid infrastructure. Different levels of testing approaches are applied before the finally implement the Grid structure in its behavior:

1. Unit Testing: Unit testing focuses on the smallest unit of software design and verify the different modules of Grid architecture. It main focuses on the internal structure and behavior of the system. We have to apply this level of test to all the interfaces of Grid structure to its basic level of processing system so that it’s achieve the higher level of abstraction to its
target system. We have to make different clusters related to all interfaces if Grid environment. To make cluster1 of different interfaces of super ordinates of Grid structure. And cluster2 to different network sensors which sense the input of data. Cluster3 is combination of all database and controller that controls the behavior of the Grid computing. By making these different clusters we have to apply different test cases. By applying unit testing, we have to define the faulty objects that are small modules interfaces in the Grid architecture.

2. Integration Testing: It is a technique constructing the Grid software structure at the same time when conducted tests to be undetected bugs with interfacing. It takes the tested components from the unit testing level. After the basic testing level of unit testing we have to apply the integration testing to one or more forms of super ordinates networks and database forms. This level of testing build a program structure according to design requirement of Grid environment.

3. Validation Testing: It is achieved through a test plans that are confirm through previous testing requirement. It defines the test cases that all behavioral and functional requirements are satisfied or not.

Upon completion of these testing criteria, we have to generate a check pointing technique to broadcast all levels of testing approaches and identify how many faulty objects are occurred from each level of testing technique. At the end of the target system, we have to apply the system testing to overall Grid architecture so that produce the reliable and flexible Grid computing infrastructure for any software system.

4. System Testing: It is basically purpose to exercise the fully Grid architecture based system through different Grid elements have been properly processed its functions so that to achieves its target system.

GU Notation of Faulty objects:
In Grid computing architecture, we have to draw a graph of objects of different interfaces and their interrelationship. After applying a series of tests to Grid structure we have to cover the graph to each object of test level from which faulty objects are introduced. Grid architecture represents each connection of different interfaces and their symmetrical link to each relationship. So, we can establish a GUI notation in which connection of faulty objects are created and cost factor is also implement in this manner also. The faulty objects are easily collected in the GUI notation, and identifies each small part of the Grid structure, which faults are created maximum time. We have to replace that linking connections and objects with each other. The graphical notation describes overall verification of the structural environment and we have to test again those faulty objects in easily manner so that they will not occur again. By applying GUI we also easily describe the cost factor of the infrastructure of Grid architecture and also the cost metrics which is applied again for tested the faulty objects. By using GUI we have to create graph matrices of different clusters which are mentioned in the testing levels. Software tool which is used on the basis of testing can also be quite useful for graph matrix. By using different levels of clusters we have to create a matrix in which all the computational values are placed in the tabular form. The values which are input for Grid software system from those values which are processed to produce target result and which are to produce faulty object values. The graph matrix is an important application of testing. This technique is quite useful to measure the values that are easily solvable in fault tolerance model and which are not solving properly.

Conclusion
In this paper, we have outline same of testing technique related to cluster approach and finally represent in its graphical notation. This approach uses the different notations of faulty objects from which we have to measure the grid computing environment. This technique described the faults arising from different errors and in complex software systems check pointing and replication are major used techniques in
fault tolerance management system. Check pointing is an running application which can provide many useful benefits like fault recovery and advanced resources.

References

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